GEOGRAPHIC SCHOOL BULLETINS

THE NATIONAL GEOGRAPHIC SOCIETY, WASHINGTON 6, D.C.

FEBRUARY 27, 1961, VOLUME 39, NUMBER 20 . . . *To Know This World, Its Life*

JOSEPH BAYLOR ROBERTS, NATIONAL GEOGRAPHIC STAFF

USING STRAW, Singapore artist "paints" old trading ships of East and West

Singapore

also — The Stars, Seagulls, Frost

Index, page 236

UMI

cloth, beads, and trinkets of gold to trade for Malayan tin and rattan. Hindu and Buddhist empires rose and fell. One king built his capital on the southern island, for he had seen a lion here. According to Malay legend, it was a good omen. He named his city *Singa Pura*—Sanskrit for City of the Lion.

By the 13th and 14th centuries, Singapore was a flourishing trade center, but invaders from Java destroyed it in 1377. Legend says blood flowed so freely from Javanese swords that Singapore's clay soil remains red to this day.

In the early 19th century, only a collection of ramshackle fishermen's huts edged by mangrove swamp and jungle gave any sign of human life on the island.

But a farsighted and imaginative agent of the (British) East India Company, Sir Stamford Raffles, saw that with Singapore he could break the Dutch monopoly of trade in Southeast Asia. In 1819 he acquired the island for Britain from the Sultan of Johore (the southernmost Malay state), and declared it a free port. Except for Japanese occupation during World War II, it remained under British rule until 1959

JOSEPH BAYLOR ROBERTS, NATIONAL GEOGRAPHIC STAFF

Warehouse of Southeast Asia: Chopstick-wielding Chinese workers (right) lunch in a Singapore rubber warehouse. This well-located city (map below) also serves as British military headquarters in the Far East and base for the Southeast Asia Treaty Organization.

© NGS

when it achieved independence within the British Commonwealth.

Since it is a free port, goods can be unloaded, stored, and reshipped without duty. In an area of trade restrictions and monopolies, Singapore prospered and grew. Though it steams and sweats under a tropical sun only 80 miles north of the Equator, immigrants swarmed in.

Today jungle has receded. Chinese farmers raise pigs and

UMI

GEORGE W. LONG

Her Majesty's Malayan Chinatown

SHINING WHITE and wearing the unmistakable stamp of the steadfast, solid, and sure Britisher, Singapore's government buildings line its busy harbor (above). From the clock in Victoria Memorial Hall, Westminster chimes toll the hours as does Big Ben in London.

Chinese pedicab drivers jostle along Mountbatten Road. Indian taxi drivers speak the Queen's English with Oxford accents, and a yacht club rises at the water's edge. The Royal Navy Base and a British Army Garrison mark Singapore as a strategic jewel in the British Crown.

But the English accent is only a facade. Singapore's heart is Oriental. It is a bustling, polyglot community of Malay policemen and fishermen, Arab shopkeepers, Indian night watchmen squatting on their *charpoys*, Indonesian sailors, Chinese women road workers carrying broken stone in baskets, and Chinese millionaires with their ever-present bodyguards.

Eight out of every 10 residents are Chinese. The city also holds Pakistani, Burmese, Ceylonese, Americans, Australians, and Europeans.

Chinese and Hindu shrines share the grounds of a local brick factory with a Methodist chapel, and the dome of a Moslem mosque rises near the white spires of an Anglican cathedral. There are Confucianists, Taoists, and Buddhists, Jews, Parsees, and Sikhs.

Singapore's location decreed its cosmopolitan personality. On a tiny (224 square miles) island off the southern tip of the Malay Peninsula, the city commands the trade routes between the Indian Ocean and the South China Sea, between Southeast Asia and Australia, and between East and West.

As early as the second and third centuries A.D. traders sailed from southern India and Sumatra with cotton

GEOGRAPHIC SCHOOL BULLETINS Copyright © 1961 by the National Geographic Society, Melville Bell Grosvenor, President. Published each week during school months by the School Service Division, Ralph Gray, Chief. Assistants: Arthur P. Miller, Jr., Frank Sartwell, Katherine Crapster, Liva Baker. Entered as second class matter, Washington, D.C. International copyright. All rights reserved. Rates: United States, $2.00 for 30 issues (one school year); Canada, $2.25; elsewhere, $2.50. U. S. only, 3 years (90 issues), $5.00. The National Geographic Society is a nonprofit educational and scientific society established for the increase and diffusion of geographic knowledge.

Like its people, it presents many faces, from the jumble of tall business buildings and modern apartment houses like those below to the thatched houses of the native Malays in the center of the city.

One-room Chinese and Indian shops flank air-conditioned five-floor department stores dealing in French perfumes and English china. Cars and buses compete with pedicabs and bicycles on narrow streets.

But for all its cosmopolitan character, Singapore is 80 percent Chinese.

Visitors hear thousands of voices in a cacophony of dialects: Cantonese, Hakka, Teochew, Hainan, Hokkien. They visit the Chinese amusement parks "Happy World," "Great World," and "New World" to ride Ferris wheels, eat Peking duck, or hear a Chinese opera.

To the Chinese, with their antlike industry, Singapore owes much of its prosperity. They began to pack up their few belongings and leave Amoy and Shanghai as soon as Singapore's reputation as a trading center reached them. They came to make their fortunes and return to their Middle Kingdom homes where ancestral spirits awaited. Many arrived in Singapore penniless and worked as laborers. Diligent and sharp-eyed for business opportunities, they often did make their fortunes. Some returned to the homes of their ancestors. Most, however, remained in Singapore, as other Chinese have remained in Hawaii, Indonesia, and all Southeast Asia. Generations pass, but the Chinese clings to his immigrant's spirit, and still intends someday to go home to China.

He lives in a Chinese section of town on a congested, tenement-lined street with laundry hanging on bamboo poles, like so many flags, from every upper-story window. Shops occupy the ground floors. Curbside vendors offer groceries and other goods.

He supports his own Chinese schools and temples, and joins his fellows in secret societies—the Little Heroes, the Thirteen Dots, the Chi Kang Tong, the 969 Gang.

His horizon is no longer limited to the lot of the stevedore or pedicab driver. Over the years he has risen to shopkeeper, banker, and international trader. Today a Chinese, Lee Kuan Yew, is Prime Minister of Singapore State.

L.B.

UMI

chickens on reclaimed land. Fruit and vegetable gardens and an occasional tobacco field flourish.

The jet plane and the rocket have chipped away some of Singapore's strategic importance in war, but the city, sixth port of the world, still thrives on trade. More than 22,000 ships a year sail into its harbor.

Passenger liners dock along miles of berths. Bamboo-awninged barges carry spices, Oriental woods, coconuts, rubber, and palm oil to freighters anchored in deep water.

"The warehouse of Southeast Asia," the city is often called. Riverside *godowns* (warehouses) bulge with goods held for transshipment.

Into this port funnels much Oriental wealth. Malaya, connected by a causeway and a railroad, exports the bulk of her major products—rubber and tin—through Singapore. Sugar comes from Formosa and Java, petroleum products from Borneo, rice from Thailand, textiles from India. Palm oil, spices, tea, and pineapples flow to Singapore to meet world trade routes.

From Europe and the United States come automobiles, construction steel, machines, chemicals, dairy products, and drugs for distribution throughout Southeast Asia.

As middleman, Singapore buys, sells, processes, stores, packs, insures, advertises, ships and reships.

Out of this bustling trade grew a banking industry, export and import houses, and even a little local industry: tin smelting, rubber refining, pineapple canning, and sawmilling.

On the southern edge of the island, the city was built over filled-in marshes and leveled hills. From a confusion of godowns, bazaars, shops, it grew into a city of 679,659 people (population of the island is 1,445,928).

Asian melting pot: above, an Indian temple notches the sky. Below, a Chinese spins the wheel of fortune—a phonograph turntable—before reading a customer's future from a fortune enclosed in a hollow nutshell.

PHOTOGRAPHS BY JOSEPH BAYLOR ROBERTS, NATIONAL GEOGRAPHIC STAFF

NO ONE KNOWS how far the universe extends. Astronomers manning the world's most powerful telescopes can see no end to the myriad of stars.

The National Geographic Society-Palomar Observatory Sky Atlas, the most thorough mapping of the universe ever achieved, expanded known space 25 times. In the atlas, astronomers have found tens of thousands of new galaxies, and they still have material to study for years to come.

Recently Dr. W. J. Luyten, of the University of Minnesota, was examining a Sky Atlas photographic plate when he detected the faintest star ever seen—a celestial body 2,000,000 times dimmer than the sun.

Stars are suns similar to the one that warms Earth. But even the nearest are so far away they appear as mere points of light.

Only about 6,000 stars are bright enough and near enough to be seen on the earth without an aid to vision. Telescopes have revealed more than 100 billion in Earth's galaxy, the Milky Way. Palomar Observatory has found nearly a billion such galaxies spangled across the heavens.

The apparent brightness of a star depends on its heat and its distance from Earth. The temperature also controls a star's color, which may be red, yellow, white, or blue. Though red-hot objects are considered very hot on Earth, they are cool by stellar standards. A red star may have a temperature of 5,000 degrees Fahrenheit but a blue-white star goes up to 60,000.

In the sky survey plate above a supergiant red star, Xi Cygni (far left), lights the North American Nebula, the white patch at upper center. This cloud of gas in the Milky Way was named for its resemblance to the continent. The two hot blue stars at upper right appear especially brilliant because the film used was sensitive to blue light.

Compared to some stars the sun is a midget. Epsilon Aurigae, for example, has a diameter 2,000 times greater than that of the sun.

For centuries man believed stars were ageless, but modern astronomers think stars may be of widely different ages. They are not so stable as they seem. Some are subject to catastrophic explosions.

A star may form from cosmic gas and dust, with gravitational attraction playing a major role. As gravitational pressure builds up within the star, nuclear reactions begin. Hydrogen may be converted into helium—the same fusion process that occurs in a hydrogen bomb.

Stars hurl energy into space on a stupendous scale. The sun is hardly a powerhouse by comparison with other stars, but it radiates energy at the rate of half a million billion billion horsepower. The stars may eventually burn themselves out and become "black dwarfs," invisible to men on Earth.

It may be, in fact, that countless dead stars now swim unseen in the skies. Dr. Martin Schwarzschild, of Princeton University, reported recently that gravitational studies indicate there is far more matter in the universe than could be accounted for by visible stars. He believes the unseen matter may consist of "cool" stars whose light is too dim to pentrate the Earth's atmosphere.

The pressure inside a star may become so great that matter is converted into forms unknown on Earth. This may explain why some stars are incredibly dense, weighing as much as 650 tons per cubic inch.

Such density can be understood when one realizes that the Earth's "solid" matter is not really solid at all. It is principally empty space spotted with tiny clusters of very dense matter known as atomic nuclei, surrounded by electrons. The atoms are kept separate by their electric charges. On some stars, astronomers believe, the electrons have been stripped away, allowing the nuclei to be packed very tightly.

Even the largest stars are mere sparks in a sea of nothingness. Between them are stretches of space so empty it surpasses the finest vacuum that man can make. E.C.

UMI

THE ENDLESS SKY

Industries cheese 44-45; Europa 14-17
Inland waterways France 40; St. Lawrence Seaway 118-119
Insects beetles 30-31
Iran 181-185
Irrigation Algeria 47-48; Angola 221; Columbia River Basin 166-168; India-Pakistan 70-72; Iran 184-185
Islam 186-187
Islands Spitsbergen 161-163; Tahiti 198-199
Japan 133-139
Komodo dragon 13, 20-21
Lakes Franklin Delano Roosevelt 166; Great Lakes 118-119; Lake Atitlán 92; Lake Mendota 197; Wolfgangsee 106
Languages Africa 164-165
Laos 202-204
Latin America *See* Brazil; Guatemala; Mexico
Lumber and lumbering California 98; Timber Carnival 178-180; United States 58-60; Wisconsin 195-196
Machinery aluminum plant 168; cable cars 162, 163; road machinery 189; turbine shaft 196
Malaya 25-29
Maps Africa 123; Alberta 87; Angola 219; Brazil 188; Columbia River Basin, United States-Canada 166; Congo River 11; Ethiopia 51; Europa 15; India 71; Indus River 71; Japan 134; Laos 203; Malaya 27; Mediterranean area, eastern 171; Moslem World 187; United States 134; Utah-Colorado 83; Yucatán 213
Markets France, Paris 38, 39; Guatemala, Sololá 93; India, Hardwar 63
Massachusetts Boston 154-156
Mediterranean Sea shipwreck 49, 54-55
Mexico sacred cave 206-211; Yucatán 205-216
Mines and minerals Alberta, sulphur 86; Algeria 48; Angola 220; Austria, salt 106-108; coal 162; Ghana 129; Malaya, tin 26, 27; South Africa 125; zinc slabs 177
Money beaver pelts 91; Bronze Age 54, 55; cheese 44
Moslem religion *See* Islam
Mountains Djurjura Mountains 47; Mount Damavand 182; Rockies 85; Schafberg 106
Musical instruments drum 103
NASA (National Aeronautics and Space Administration) 73-77
National Monuments Dinosaur National Monument 83-84
National Parks Canada, Banff 85, 86
Netherlands *Europoort* 17; Rotterdam 18-19
New York Niagara Falls 6-7
Niagara Falls 6-7
Norway *See* Spitsbergen
Oceans bottle oceanography 116-117; tidal bore 33
Oil Alberta 86, 89; Algeria 46, 48; Iran 184
Oregon Timber Carnival 178-180
Paintings Maya 212; Prince Henry 114; Pueblo Indians 225
Pakistan Indus River 71, 72
Passports 56-57
Photography hummingbirds 79; satellites 23, 24
Plants bluestem grass 105; cactus 31; poppy 204; sisal 216; *Weltwitschia mirabilis* 219 *See also* Agriculture; Trees
Portugal 109-113 *See also* Angola; Henry, Prince, the Navigator
Prairies 104-105
Prehistoric man 94-96
Quebec ice canoes 174
Religions Buddhism 200-201; Eastern Orthodox priest 170; Hinduism 66-67; Islam 186-187; Shintoism 134, 138-139
Religious shrines cathedrals, Addis Ababa 53, Chartres 40, Mérida 214; Kaaba 187; Mont St. Michel 42-43; mosques, Iran 181, 182; sacred cave 206-211; temples, Buddhist 25, Hindu 67; *torii*, Japan 138
Rivers 80-81; animal life 190-191; Columbia 166-168; Congo 10-12; erosion 222-223; Golden Water 5; Indus 70-72; Mohawk 80; Niagara 6-7; Rio Grande 91; Spokane 168; Susquehanna 81; Thames 8; Yampa 84
Rockets and satellites NASA 73-77; Saturn 150-151; *Tiros* 22-24
Saturn (rocket) 150-151
Science tree hybridizing 59 *See also* Geology; Gravity; Rivers; Rockets and satellites; Weather
Shintoism 134, 138-139
Singapore 229-233
Space travel *See also* Rockets and satellites
Spitsbergen 161-163
Sports calisthenics 3; ice boating 197; ice canoeing 174; logrolling 180; skiing 32, 47, 97
Stars 234-235
Statues Civil War 142; Greek 169; Rotterdam, symbol 18
Swans 8-9
Tasmania 176-177
Tiros I 22-24
Trade Chicago 227-228; economic union, Europe 14-17; English Channel 152
Transportation bicycles 18; buses, Ghana 130-131; EUROP 14-15; pedicabs 2; trains 220, 228 *See also* Boats and ships; Highway
Trees date palm 99; tree farming 58-60
Triton (submarine) 192
Union of South Africa 121-125
Union of Soviet Socialist Republics 162
United States Great Lakes 118-119 *See also* Arizona; Boston; California; Chicago; Columbia River; History; National Monuments; New York; Oregon; Prairies; Wisconsin
Victoria Falls 126-127
Waterfalls Niagara 6-7; Victoria Falls 126-127
Weather frost 240; ice, Great Lakes 118-119; *Tiros I* 23-24; warming world 157-160
White House 145-149
Wisconsin 193-197
Zoos Frankfurt Zoo 13

Please begin sending me the
Geographic School Bulletins

National Geographic Society
School Service Division
Washington 6, D. C.

☐ 1-year subscription, $2.00 (U.S.)
$2.25 (Canada) $2.50 (elsewhere)

☐ 3-year subscription, $5.00 (U.S. only)

NAME

ADDRESS

CITY, ZONE, STATE

458 20-1

UMI

Africa earliest man 94-96; languages 164-165; Pygmies 102-103 *See also* Algeria; Angola; Congo River; Ethiopia; Ghana; Union of South Africa; Victoria Falls
Agriculture Alberta 87, 88, 89; Algeria 46-48; Angola 219, 220; California 99-101; climate changes 158-160; corn 224-225; Ethiopia 51-52; France 40; Germany 140-141; Ghana 128-129; Greece 171, 173; India 63-64; International Farm Youth Exchange 140; Iran 183-185; Japan 134, 136, 137; Laos 202-204; Malaya 26, 28; Mexico 215, 216; Pakistan 72; Portugal 112-113; sisal 216; South Africa 123; Tasmania 176, 177; tree farming 58-60; Wisconsin 195
Alberta 85-89
Algeria 46-48
Angola 217-221
Animals bear, polar 160; beaver 90-91; buffalo 104; cattle 88, 123; dolphin 160; elephants 202; goat 45; horses 88; Komodo dragon 13, 20-21; lion 50; moose 160; oxen 52, 109; prairie dog 105; river dwellers 190-191; sheep 47, 96
Archeology earliest man 94-96; Mexico 205-213; underwater 49, 54-55
Architecture China 2, 4, 5; Ethiopia 50; Ghana 128; India 62, 65; Malaya 29; Netherlands 19; South Africa 125 *See also* Castles; Dwellings
Arctic regions Spitsbergen 161-163
Arizona beetles 30-31
Asia *See* China; India; Indonesia; Iran; Japan; Laos; Malaya; Pakistan
Astronomy stars 234-235
Atomic energy Euratom 16
Australia Tasmania 176-177
Austria Salzkammergut 106-108
Beavers 90-91
Birds ducks 190; fish hawk 191; gulls 238-239; hummingbirds 78-79; swans 8-9
Boats and ships barges 18, 40; *Bounty* 198-199; Bronze Age ship 54; canoe 192; Chicago 228; *Constitution* (frigate) 155-156; *Explorer* 116; fishing boat 109-111; freighter 163, 196; ice canoe 174; iceboats 197; icebreaker 118-119; *Liberté* 152; *Ouise* 221; rafts 29; *Sagres* 115; shipyard 108, 113; Thames 8; *Triton* 192; tug 10
Boston 154-156
Brazil highway 188-189
Breadfruit 198-199
British Commonwealth *See* Australia; Canada; England; Ghana; India; Malaya; Pakistan; Singapore; Union of South Africa
Buddhism 200-201
California 97-101
Canada Great Lakes 118-119; Niagara Falls 6-7 *See also* Alberta; Columbia River; Quebec
Castles France 38, 40
Caves sacred cave (Mexico) 206-211
Central America *See* Guatemala
Cheese 44-45; 195
Chicago 226-228
Children Algerian 46; American 56; Chinese 1; European 13, 15; German 35; Ghanaian 129, 132; Iranian 183
China Peking 1-5
Civil War Centennial 142-144
Clothing Austria 106-108; Ethiopia 53; Germany 35, 36; Ghana 129; Greece 171; Laos 204; Maya 214
Columbia River 166-168
Communism China 1-5
Congo River 10-12
Conservation beaver dams 90, 91; prairies 104-105; woodlands 58-60
Corn 224-225
Crafts carving 36; clock making 35; embroidery 135; lantern making 134; Panama hats 216; rugmaking 64, 183
Dams beaver dams 90, 91; Grand Coulee 166; India-Pakistan 71-72
Dances African 124; Indian 61; Japanese 137; Malayan 28; Polish 193, 194
Deserts Moçâmedes 219; Sahara 46-48
Dinosaurs 82-83
Diving 49, 54-55
Dwellings Angola 221; Austria 107; California 100; Congo 12; Ethiopia 52; Laos 202; Malaya 29; Maya 214; White House 145-149
Education China 1, 4, 5; European School 15; Ghana 129; Malaya 29; United States, Boston 156
Electric eel 175
England swans 8-9
English Channel 152-153
Ethiopia 50-53
Europe Europa 14-17 *See also* Austria; England; France; Germany; Greece; Netherlands; Portugal
Fairs Calgary Stampede 88-89
Festivals Germany 36; Japan 139; Malaya 28; Quebec Winter Carnival 174; Timber Carnival 178-180
Fish and fishing Alberta 89; California 98; codfish 158; electric eel 175; Fish Pier, Boston 155; Greece 172; Japan 137; Mexico 215; Portugal 110-111; trout 191; Wisconsin 197
Food bratwurst 194; breadfruit 198-199; cheese 44-45, 195; China 5; corn 224-225; France 41; Greece 172; pear cactus 31
Fossils dinosaurs 82-83; earliest man 94-96
France 37-43
Frost 240
Gas Alberta 86, 89; Algeria 46, 48
Geology erosion 222-223; glaciers 159 *See also* Mines and minerals
Germany Black Forest 34-36; farms 140-141
Ghana 128-132
Gravity 32-33
Greece 169-173
Guatemala 92-93
Gulls 238-239
Harbors and ports Bombay 68-69; Boston 154-156; Calcutta 63; Cape Town 122; Chicago 226-228; *Europoort* 17; Honfleur 41; Kavalla 172; Léopoldville 12; Longyearbyen 163; Malaya 27, 29; New Orleans 223; Plymouth, England 152; Rotterdam 18-19; Salonika 170; Singapore 229-233
Henry, Prince, the Navigator 114-115
Highway to the Amazon 188-189
Hinduism 66-67
History American: Boston 154-156, Civil War 142-144, White House 145-149, Wisconsin 194-195; France 39-43; Greece 170, 171, 173; Iran 183-184; Prince Henry 114-115; S. Africa 122-125
Hummingbirds 78-79
Illinois Chicago 226-228
India 61-72
Indians Guatemala 92, 93; Maya 208-216; Pueblo 225; Toltecs 206-213
Indonesia Komodo dragon 13, 20-21
Indus River 70-72

Complaints are also heard from boat and wharf owners who find their property soiled by a seemingly endless procession of careless gulls.

Gulls are still protected, but persons afflicted by the birds can get a special permit to allow them to cut down the population. The Fish and Wildlife Service has experimented with methods of easing the pressure.

First, workers tried breaking the eggs on the gulls' island breeding grounds. The birds simply laid more eggs and hatched them.

Then a deadly solution was sprayed on the eggs. The eggs were killed, but the adults continued to incubate them and did not lay new eggs.

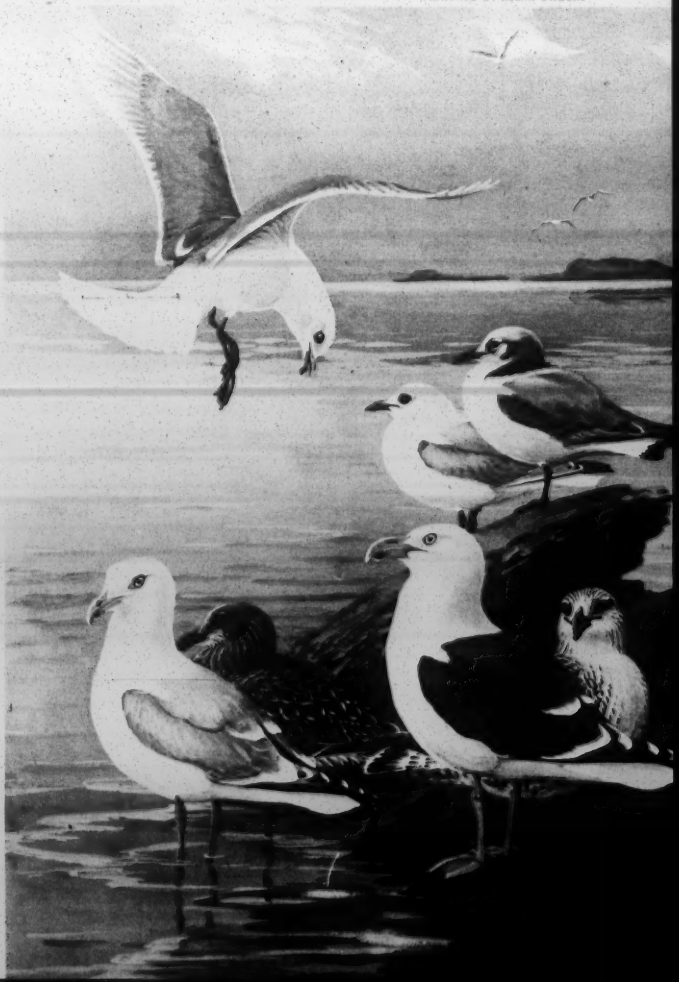
Even this technique has failed to pay off in terms of time and money spent, and it has been given up—for the time being.

Recorded fright cries of the birds were broadcast at gull concentrations—in hi-fi and stereophonic sound. At first effective in scaring gulls away from places where they were not wanted, the recordings lost their value when the birds seemingly decided that they were calling "wolf" too often. They soon ignored the racket.

In an experiment, Fish and Wildlife experts baited a flock of herring gulls with bread, then cast poisoned pieces upon the waters. The method proved effective for strictly local control.

In laboratories, scientists are working on new techniques—including scaring gulls by ultrasonic vibrations—for use next summer. F.S.

PAINTING BY ALLAN BROOKS



Gull gathering: Most common of seagulls is the herring gull. The white, gray, and black adult stands in the shallows at lower left in front of an immature bird. Bigger and fiercer is the great black-backed gull at lower right with a young bird.

Above them hovers a glaucous gull, also called the burgomaster. Like the black-backed, it preys on the young of other seabirds. The two smaller birds at center right are mature and young kittiwakes, which often sleep floating on the waves. There are 23 other species of gulls found at least occasionally in North America.

Although popularly called "seagulls" these birds also flock around bodies of water 1,000 miles from the ocean.

UMI

A Multitude of Gulls

CLIFFORD D. RICE

THOUGHTLESS man has exterminated many birds, but some he has helped.

The robin, for example, has increased tremendously since the first settlers appeared in North America. The white man's lawns and clearings are fine feeding grounds for these worm-loving birds—much better than blanketing forest.

The house sparrow, the starling, and the pigeon have similarly adapted to man's civilization and are doing well—some persons feel too well.

Those three birds, all imported from Europe, left their natural enemies behind and have multiplied greatly in the United States.

But a native American is seemingly about to join the list of "pest" birds.

Oddly, it is one that for a time seemed in danger from man's activities.

The herring gull is doing so well along the New England coast that the U. S. Fish and Wildlife Service is seeking ways to cut down its numbers.

It was not always so. Around 1900, when bird feathers were the most fashionable adornment for a lady's hat, gulls were killed off wholesale.

An aroused public, led by conservationists, called a halt to the slaughter; gulls were placed under protection.

No longer hunted or molested on their feeding grounds, the gulls made a modest comeback. But as more and more men lived along the coasts, garbage and sewage increased greatly, and the gulls, born scavengers, thrived. This was a fair exchange for a time—the gulls did well, and helped clean up rivers and estuaries.

Now the gull population is becoming much too large. Airport managers are frightened that the soaring birds, which tend to congregate along runways, will be sucked into jet engines, or smash through windshields to blind pilots. At least one plane has crashed after collision with a gull.

Gulls no longer starve in the winter, but survive to attack the blueberry crop the next summer in increased numbers. Farmers are up in arms.

AP FROM PRESS ASSOCIATION, INC.

THE TWO FACES OF FROST

TO CHILDREN frost is a gifted artist that traces lacy masterpieces on windows. But to adults it is a nuisance. Frost whitens their windshields and ruins their crops and dispositions.

Artist or archenemy, frost forms when relatively warm, moist air comes in contact with a freezing surface. Water vapor held in suspension in the air freezes into tiny ice crystals. Frost is not "frozen dew," as it is sometimes called. It turns directly from vapor into ice, without going through a liquid state. You may see frost at any time of year coating the cooling unit of a refrigerator.

The frost-free period of the year determines the farmer's growing season. Frost and its accompanying freezing temperatures cause plant juices to swell, bursting delicate plant cells. In the deep South the time between the last spring frost and the first nip of autumn is about 200 days. In northern states like Minnesota and Maine the period shrinks to 100 or 125 days.

Luckily, frost can be predicted accurately. Especially vulnerable to its ravages are citrus growers. Florida and California weathermen keep a careful watch for the approach of freezing temperatures.

Once alerted, the farmer swings into action. He may throw a covering over his plants to conserve their heat. With big wind machines he may mix cold, ground-hugging air with higher, warmer air. Or he can add heat to the air to drive frost away. The old smudge pot is giving way to new machines that beam infrared rays onto fruit and vegetables.

A.P.M.

UMI